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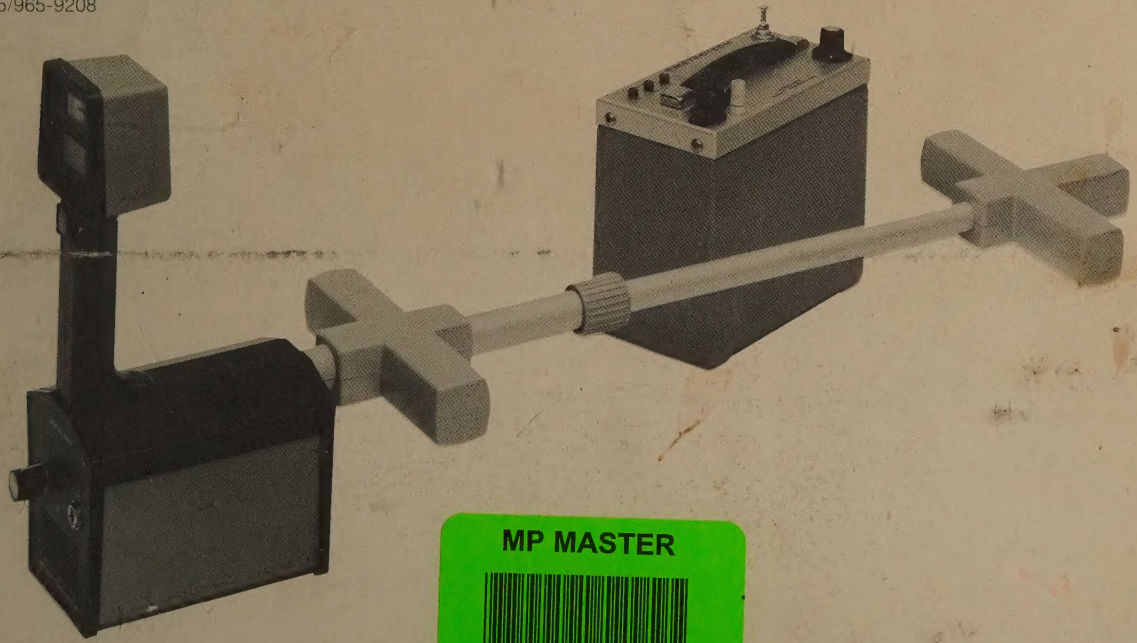

MP MASTER
MA26490

LINE TRACER MODEL 850

Operation Manual

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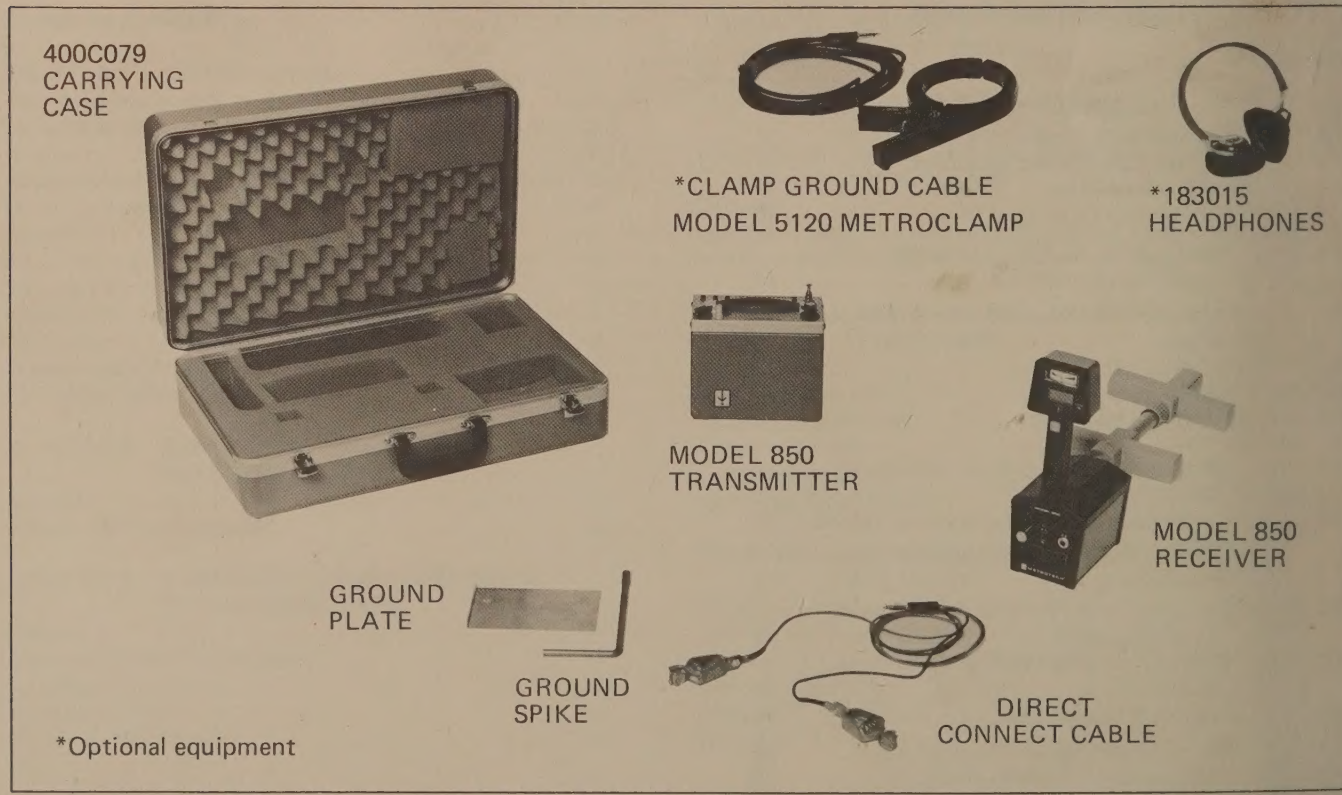

Figure 1-1 The Model 850 Line Tracer with Accessories

The Operation Manual

1.01 This manual tells you how to operate and maintain the Model 850 Line Tracer. This equipment is simple to operate, and field maintenance is limited to charging the Transmitter batteries and replacing the Receiver batteries.

1.02 This manual gives procedures for locating buried cable and pipe. This chapter describes the equipment and how to use it. Chapter 2 describes connecting the Transmitter output directly to the conductor to be traced. Chapter 3 tells you how to induce a signal into a conductor. Chapter 4 gives a procedure for finding the depth of a conductor. Chapter 5 describes using the Metroclamp. Chapter 6 gives additional information relating to the type of cable or pipe, and how the condition of the soil may affect results. Chapter 7 describes battery replacement and gives warranty conditions.

1.03 If you have difficulty with a particular situation, METROTECH can help you. You can call Customer Service toll free at 1-800-METRO TC.* METROTECH can also supply training material, application and technical notes.

NOTE

The word "conductor" is used in this manual to describe a continuous metallic pipe, cable, or conduit.

1.04 The Model 850 Line Tracer Transmitter puts an audio-frequency tone on the pipe or cable. The Receiver can trace this signal along the conductor, indicating the signal strength as a digital meter level, and as an audible tone. The direction to the conductor is shown on a directional meter.

1.05 Receiver indications will vary during use due to the size and depth of the pipe or cable, and whether it is insulated, wrapped, coated or bare. These indications will also be affected by the condition of the surrounding soil, the length of time the conductor has been buried, and the location of other conductors and metal masses. See Chapter 6 for more details.

SAFETY WARNINGS

Do not connect the Transmitter directly to a live power cable. Always cut power to such cables before connecting the Transmitter.

Always turn the Transmitter OFF before connecting the output to a pipe or cable.

Do not touch the Transmitter output cable connector when power is applied.

*In the U.S. except California. In California and outside U.S. call 415–965-9208.

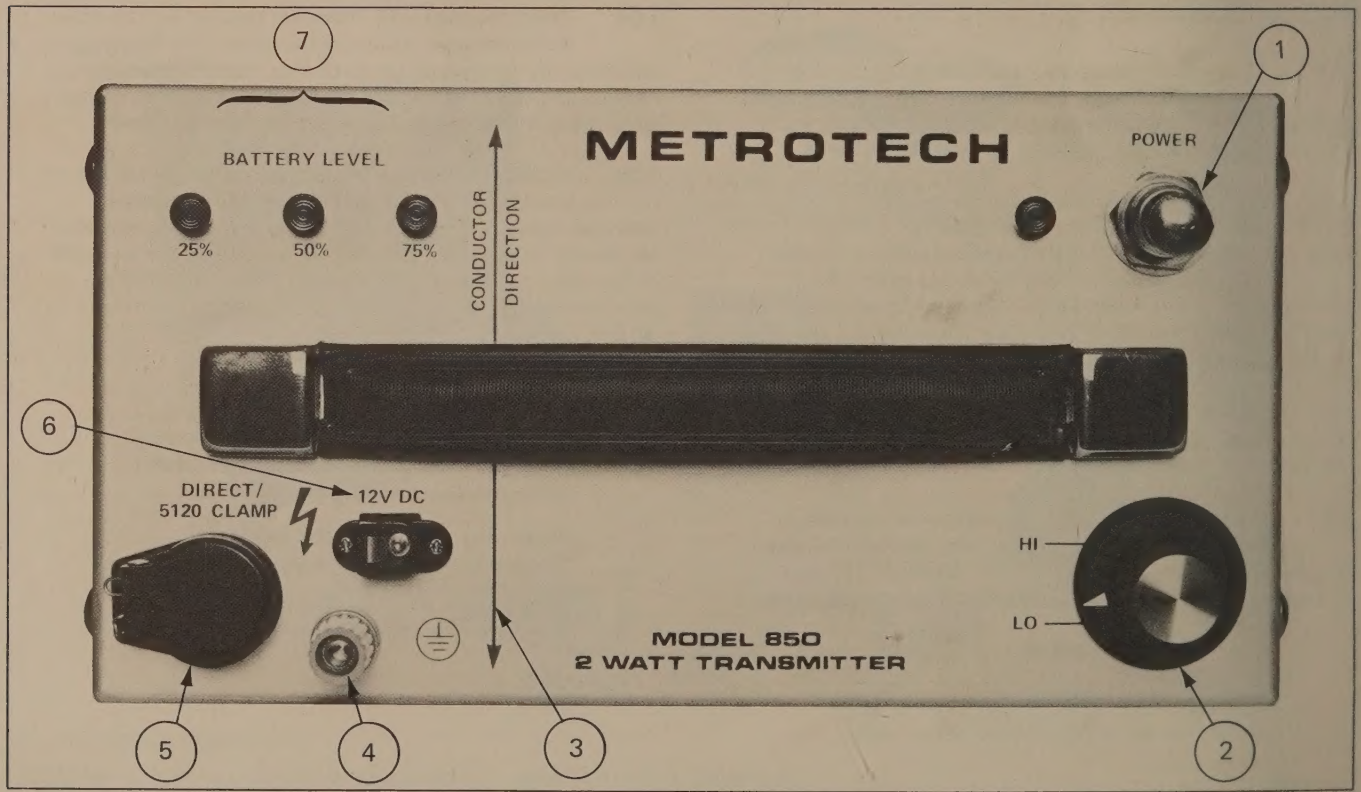

Figure 1-2 Transmitter Controls and Indicators

HELPFUL HINTS

Get a good ground when using the direct connect cable or the optional 5120 Metroclamp. See Chapter 1 and Chapter 5.

If possible, disconnect a cable from a common ground with other services before tracing it.

Be aware of other buried pipes or cables that may affect indications of the target conductor.

Check the batteries of the Transmitter and Receiver each day before you use the equipment.

Description of the Equipment

1.06 The equipment consists of the standard equipment listed below, and some optional accessories:

Standard Equipment:

1. Model 850 Transmitter, 2 watt, with battery charger;
2. Model 850 Receiver;
3. Direct Connect Cable, Ground Spike and Ground Plate (800B004);
4. Carrying Case (400C079).

Optional Accessories:

1. Model 5120 Metroclamp and Jumper Cable;
2. Headphones (183015).

1.07 This equipment is illustrated in Figure 1-1. The Transmitter generates a signal which is put onto a pipe or cable. This signal travels along the cable for some distance, getting weaker as it leaks away. The distance that this signal goes before it becomes too weak for the Receiver to detect depends on the method of connection, the type of conductor, the surrounding soil, and the depth to which the conductor is buried. The signal is detected by the Receiver when the Receiver is positioned over the buried pipe or cable. There are two methods of putting the signal onto the pipe or cable: direct connection or induction.

Direct Connection

1.08 The direct connect method connects the Transmitter DIRECT/5120 CLAMP output to the conductor using the direct connect cable. This gives a metallic contact to the conductor, and is the preferred method to use whenever possible. This gives a strong signal to detect, and you can use the Receiver closer to the Transmitter. Also you can connect to a single lead in a multiconductor cable, and trace its path amongst all the other conductors in the cable.

Induction

1.09 If you cannot connect the Transmitter signal directly to the conductor, the Transmitter signal can be induced into the conductor by electromagnetic induction, described in Chapter 3. The output signal is radiated by an

antenna, creating a magnetic field which couples with the conductor, and the signal is induced into the conductor. This is done by placing the Transmitter on the ground over the buried conductor. It is important to remember that the transmitter field is strong in one direction, and the Transmitter must be positioned in relation to the direction of the path of the conductor. Also, if the Receiver is turned on while close to the Transmitter, the Receiver will detect more signal through the air (air coupling) than through the conductor. This will give false indications.

Measuring the Depth of a Conductor

1.10 The Model 850 can measure the depth to which a conductor is buried.* First locate the conductor in the usual way. Position the Receiver probe vertically over the conductor, and the digital indicator on the Receiver will indicate the conductor depth in inches (or centimeters). This is described in Chapter 4.

Using the Accessories

1.11 A carrying case is provided for the Model 850, which allows you to carry the Transmitter, Receiver, Metroclamp, cables and the manual.

1.12 The Model 5120 Metroclamp is available, which can be attached to the Transmitter and Receiver. It must surround the conductor, and the jaws must be completely closed.

1.13 The Metroclamp is the recommended method of putting a signal onto a pipe, cable or conductor if a direct connection cannot be made. This method also allows you to put a signal on one conductor in a telephone cable without breaking the insulation.

1.14 The Metroclamp can also be used with the Receiver to detect the conductor carrying the Transmitter's signal. This allows you to identify a conductor that is clustered with other conductors, or is in a congested area.

1.15 A Headset can be used with the Model 850 receiver if the noise around the site makes the audio output difficult to hear. A jack is provided for the headphones.

Controls and Indicators

1.16 The following controls, indicators and other important items are shown in Figures 1-3 and 1-4.

Controls and Indicators on the Transmitter

1. POWER ON/OFF switch. Pull for ON. Each time the Transmitter is turned on, it automatically displays the battery condition. See [7] below.

*See Chapter 4.

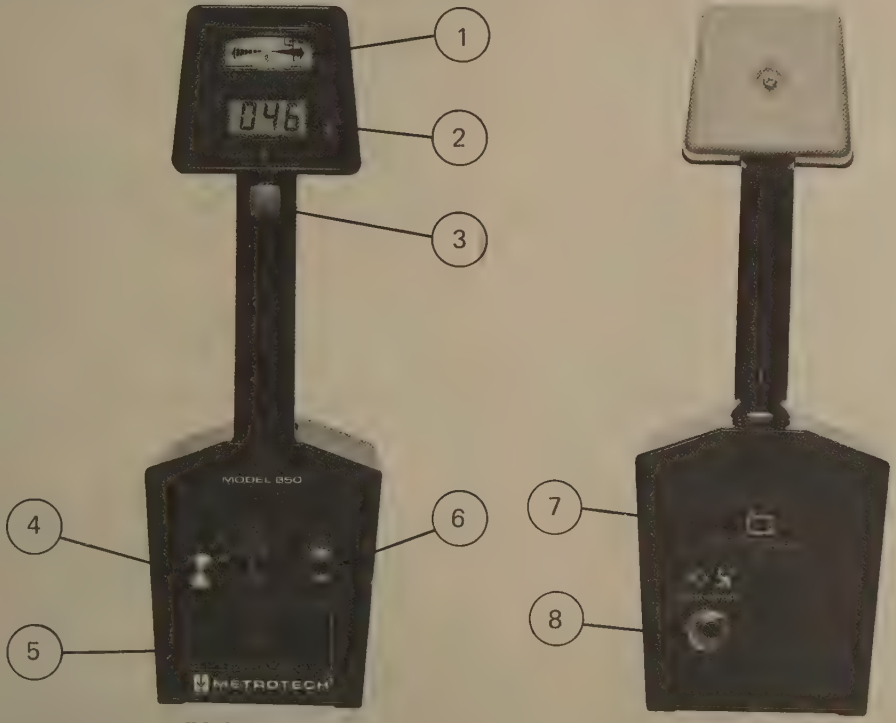

Figure 1-3 Receiver Controls and Indicators

2. HI/LO switch. Sets output power. When set to LO, the Transmitter outputs 0.6 watt, and has a useful battery life of about 24 hours. When set to HI, the Transmitter outputs about 2 watts, and has a battery life of 6 to 8 hours. Use the LO POWER setting unless the additional power is required. See Chapter 6 for more information.

3. CONDUCTOR DIRECTION. When the Transmitter is used to induce a signal into a conductor, the Transmitter should be placed over the conductor, and the arrow aligned with the conductor. This is not necessary when the direct connect or Metroclamp is used.

4. [GROUND SYMBOL]. Safety Ground. It is recommended that the Transmitter be grounded when in use.

5. DIRECT/5120 CLAMP. A jack for the Transmitter signal output when using the direct connect cable or Metroclamp. The internal antenna is automatically disconnected when a plug is inserted into this jack.

6. 12V DC. This is the connector for the battery charger input.

7. % BATTERY CHARGE. When the Transmitter POWER switch is pulled ON, three lamps indicate the condition of the battery. Lamps indicate that 25%-50%; 50%-75% or 75-100% of the battery capacity remains. See HI/LO POWER [2] above to convert this into useful time remaining.

Controls and Indicators on the Receiver

1. Directional Meter. This indicates the direction to move the Receiver to go towards the buried cable. The battery test indicator is also on this meter.

2. Digital Meter. This meter indicates the strength of the signal detected, up to a maximum of about 960, and a minimum of 550.* Use this meter to locate the position of the peak signal accurately. When button [3] is pressed, this indicator shows the depth of the conductor in inches (or centimeters).

3. This button causes the digital display [2 above] to indicate the depth of the conductor.

4. Selector Switch. This switch has four operating positions as follows:

– Power Off

– Battery Test, check meter [1].

– Select this position for conductor tracing, or to estimate the depth of conductor when [3] is pressed.

– Select this position when the Metroclamp is used.

*The 850 Receiver will trace when meter indications fall below 550, but depth indications will not be accurately displayed.

5. Speaker. This gives an audio tone which pulses when movement to the left is required, and gives a continuous tone when movement to the right is required, following the indication of the arrows on the display [1] above.

6. Headphone jack. Jack for the optional headphones.

7. BATTERY ACCESS. Releases the cover to allow the batteries to be replaced.

8. EXT INPUT. Jack for the Metroclamp cable plug.

Operating the Transmitter

1.17 The Transmitter generates an audio-frequency signal which is put onto a conductor to allow the conductor to be located or traced. First find the conductor. If the conductor is above ground or in a manhole, connect the Transmitter output directly to it, or if you have the Metroclamp, use that.

1.18 The direct connect method is preferred where you can get access to the conductor. Use the direct connect cable provided, connecting the red lead to the conductor and grounding the black lead. Details are given in Chapter 2.

1.19 If it is not possible to connect directly to the conductor, the signal can be induced into the conductor. The Transmitter generates a signal through an internal antenna in the direction of the arrow on the panel. See Figure 1-4 and Chapter 3.

1.20 AUTOMATIC BATTERY TEST. The Transmitter has a rechargeable battery. Each time you pull the power switch ON, the battery indicator lamps light to tell you the percentage charge remaining, so that you can determine how much operating time remains on the present charge. See Chapter 7 (Maintenance) for these details.

Operating the Receiver

1.21 The Receiver is a light hand-held device with a sensor tuned to the Transmitter's audio signal. The cross-shaped sensor is mounted at the end of a telescoping tube, to allow the sensor to work close to the ground where the signal is strongest. The Receiver has a directional meter to point to the buried conductor. The Receiver digital meter indicates the strength of the received signal, or the depth of the conductor in inches (or centimeters) when the orange button is pressed.* A built-in speaker gives an audible tone which changes with the strength of the signal detected by the receiver.

NOTE

The "go to the right" arrow on the meter is solid and the tone is continuous.

The "go to the left" signal is indicated by a broken arrow and a pulsed tone.

*See Chapter 4.

1.22 The Receiver has a jack for optional headphones for work in noisy areas.

1.23 The Receiver also has a jack for the Model 5120 Metroclamp.

1.24 The Receiver is powered by four NEDA 1604A alkaline 9V cells. The condition of these batteries can be checked at any time. Batteries should always be checked at the beginning of each day.

1.25 When using the Receiver, loosen the nut on the sensor tube and extend the tube as far as possible. Tighten the nut to secure the probe. Always retract the probe when the Receiver is not being used.

1.26 Hold the handle of the Receiver, and point the probe to the ground and hold the Receiver upright as shown in Figure 1-2. Always go some distance away from the Transmitter before turning the power ON to avoid picking up unwanted signal through the air (at least 45 feet).

1.27 Turn the power ON. Slowly swing the unit from side to side around the target area. The tone will be heard and the meter indicate when some signal, however weak, is detected. Go in the direction indicated by the arrow and the tone.

1.28 The signal will get stronger (higher number on the digital meter) as you approach the conductor location. Find and mark the point where the signal is at a peak. You will notice that the Receiver is very sensitive and you can point to the location within an inch or so.

1.29 If you want to trace the conductor, walk away from the Transmitter, looking for the peak signal at all times. As you get further from the Transmitter, the signal will get weaker. The maximum signal indication is about 960; this may fall to about 500 or lower before the signal is too weak to give reliable depth indications.

1.30 A standard color marking arrangement is used to distinguish between different types of buried pipe or cable. Always use the color which indicates clearly the type of conductor you are marking. These colors, as established by the APWA, are as follows:

Electric Power Lines or Conduits	Safety Red
Communication Lines or Cables	Safety Alert Orange
Gas, Oil, Petroleum or other Hazardous Gases	High Visibility Safety Yellow
Storm and Sanitary Sewers	Safety Green
Water	Safety Precaution Blue

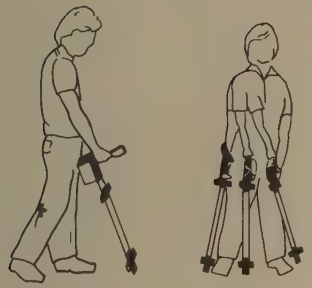

Figure 1-4 Using the Receiver

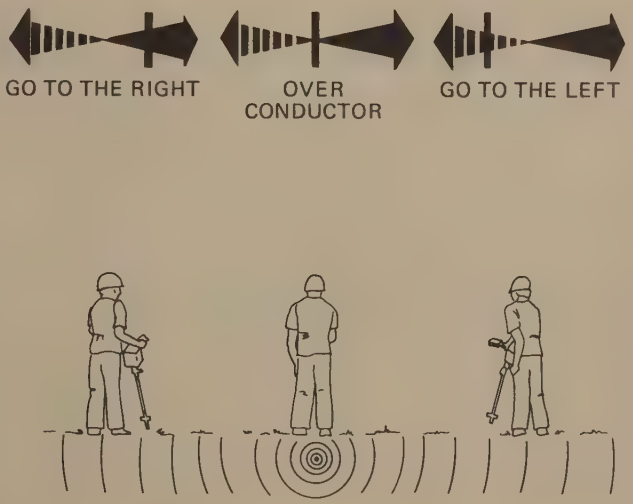

Figure 1-5 The Receiver Directional Meter

General

2.01 The signal from the Transmitter DIRECT/5120 CLAMP jack is connected directly to the conductor, using the direct connect cable. The connection may be made to a hydrant, a conductor in a cable, or any place where a metal to metal contact can be made. See Figure 2-1.

2.02 Connect the RED lead to the conductor. The BLACK lead must be grounded to complete the circuit. Locate the ground point as far as possible from the Transmitter and conductor as shown in Figure 2-1. Do not get close to or cross any adjacent buried conductors.

2.03 To trace non-metallic pipe such as sewer line or a duct that does not have a tracer wire or tape, insert a snake or fishtape into the pipe, then connect the transmitter to the inserted conductor. Follow the same instructions. We recommend that the snake or fishtape be grounded at both ends for the best results.

Tracing a Buried Conductor

1. Connect the Direct Connect cable RED lead to the conductor, and plug the other end into the DIRECT/5120 CLAMP jack on the Transmitter.

2. Place the Transmitter on the ground as far as possible from the conductor to be traced.

3. Extend the ground BLACK lead as far as possible from the transmitter in the same direction away from the conductor. Insert the ground spike into the ground and connect the ground lead to it. If it is not possible to insert the spike, use the ground plate.

4. Set the output level to LO (unless the situation requires more power).

5. Pull the POWER switch ON. The battery indicator lights will flash, for five seconds, then go OFF. After a few seconds, the power output light will begin flashing, and this indicates that the unit is putting out power.

6. Take the Receiver and extend the probe sensor tube.

7. Go to the area where you expect to find the conductor, at least 45 feet from the transmitter. Pull the Receiver POWER switch ON.

8. Trace the conductor as described in Chapter 1 and mark its location as required.

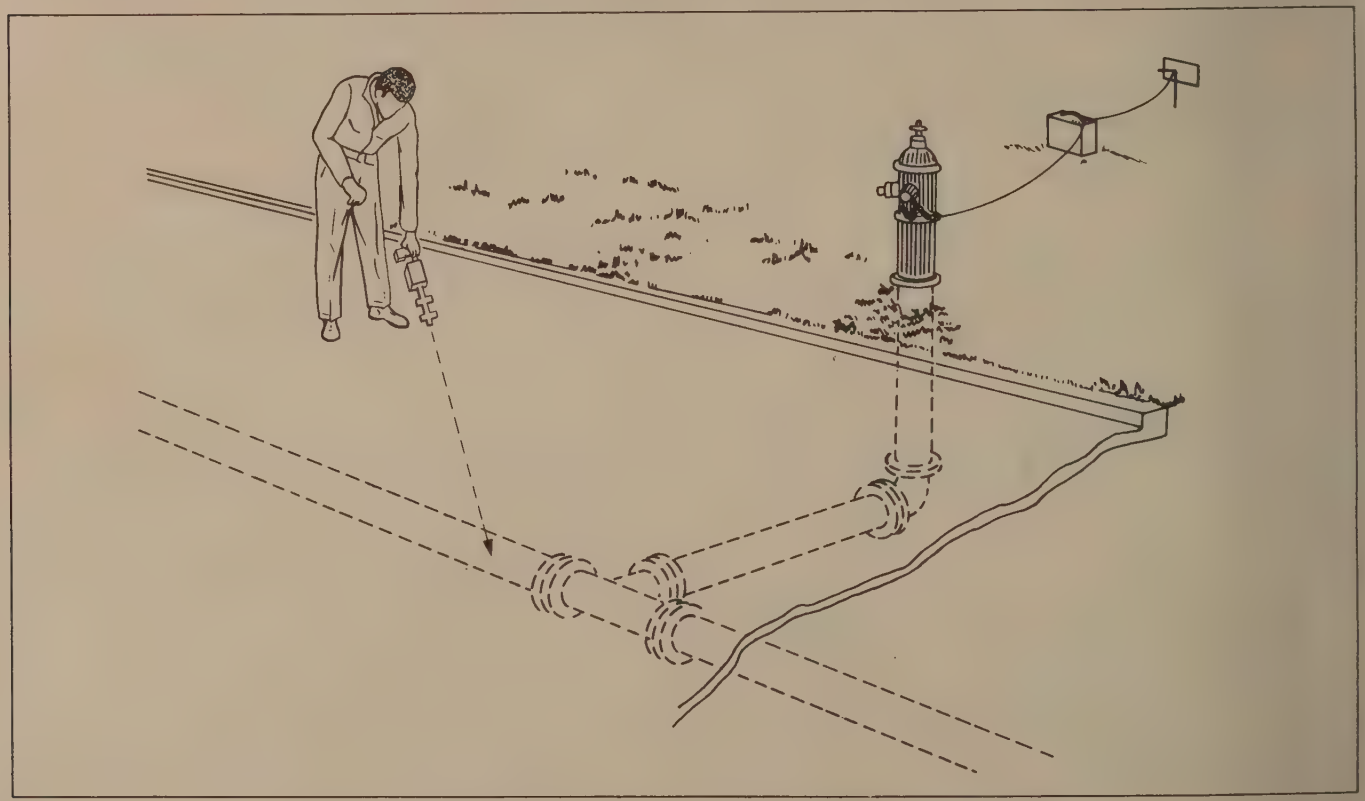

Figure 2-1 Locating a Buried Pipe or Cable Using the Direct Connect Method

General

3.01 In these procedures, the Transmitter is placed over or close to the conductor to be traced, and the signal output by the Transmitter antenna is induced into the cable as shown in Figure 3-1. The Transmitter radiates the signal in one direction, so you must place the Transmitter correctly over the conductor. An arrow on the top panel shows this direction.

3.02 No ground connection is needed when inducing a signal into the target conductor in this manner.

3.03 Use the Receiver to trace the path of the conductor. Go at least 45 feet from the Transmitter in the direction of the conductor to avoid air coupling between the Receiver and Transmitter.

Tracing a Buried Pipe or Cable

1. Pull the transmitter POWER switch ON.

2. Position the transmitter over the buried conductor (see Figure 3-1), making sure that the Transmitter arrow is lined up with the conductor.

3. Check that the Transmitter is directly over the conductor. If you are not sure, go at least 45 feet from the Transmitter and locate the conductor with the Receiver. Have someone move the Transmitter around as you look for the highest reading on the Receiver digital meter.

4. Set the output POWER level to LO, unless the high power setting is needed for this situation.

5. Select the Receiver, and extend the probe.

6. Go to the assumed location of the conductor, at least 45 feet away.

7. Select the position on the Receiver select switch. Hold the Receiver upright over the area where the conductor should be, listen to the audio tone and look for the meter indications. See Chapter 1 for details.

8. Position the receiver over the conductor, as indicated by the directional meter and audio tone. Confirm the location of the conductor by obtaining the highest reading on the digital meter. Mark the spot.

9. Repeat this procedure for as far as necessary, or until the signal becomes too weak. Move the Transmitter along if more signal strength is required, or set the output level to HI.

Locating a Service

3.04 Figure 3-2 shows how to locate a service from a main pipe. Services which are not directly electrically connected to the main are better located with the Model 810 or 480.

Locating a Bend

3.05 Figure 3-3 shows how to trace a pipe or cable around a bend.

Locating a Dead End

3.06 The receiver will detect the exact location of the end of a pipe. See Figure 3-4.

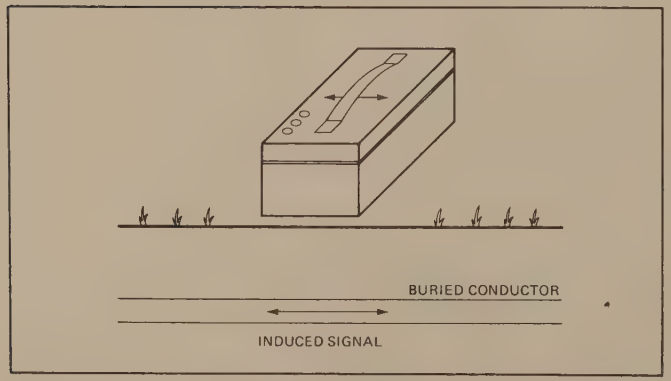

Figure 3-1 Positioning the Transmitter for an Induced Signal

Figure 3-2 Locating a Service

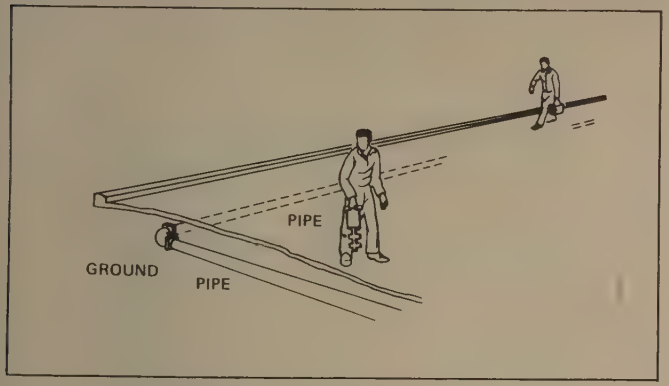

Figure 3-3 Locating a Bend

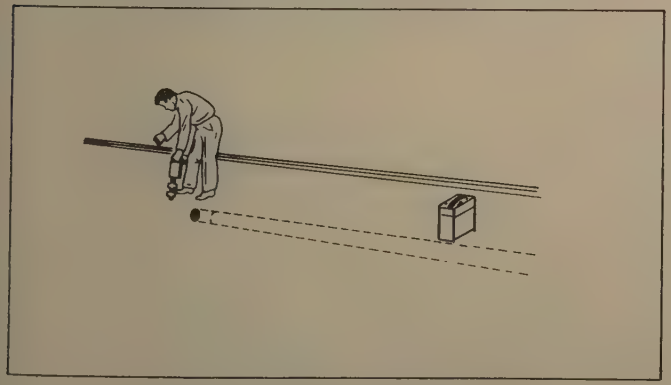

Figure 3-4 Locating a Dead End

General

4.01 The MODEL 850 Receiver allows you to estimate the depth of a buried conductor.

4.02 First find and mark the location of the conductor using any of the methods described in this manual. Leave the Transmitter on.

4.03 The sensor probe on the Receiver must be fully extended. Place the end of the probe on the ground on the mark which locates the buried conductor. Hold the Receiver vertically.

4.04 The depth in inches (or centimeters) is indicated on the digital meter when the orange button on the Receiver is pressed.

General

5.01 This section tells you how to use the optional Model 5120 Metroclamp, attached to either the Transmitter or Receiver. Single conductors in a multi-conductor cable can be traced using Metroclamps on both the Transmitter and Receiver simultaneously. A signal can be put onto or detected on a conductor without breaking the insulation. It is possible to use a Metroclamp at both ends to check a conductor from manhole to manhole, or between drop to junction.

5.02 The Metroclamp is placed around a pipe, cable or a single conductor. When used with the Transmitter, it induces the signal into the conductor without metallic contact. The conductor must provide ground in both directions for a good signal to be inducted into the conductor, as shown in Figure 5-1. If the conductor length is limited by an insulator, as shown in Figure 5-2, a ground must be provided for the signal to flow.

5.03 When used with the Receiver, the Metroclamp detects the signal placed on the conductor by the Transmitter. No grounding is necessary.

Using the 5120 Metroclamp with the Transmitter

1. Plug the Metroclamp cable into the DIRECT/5120 CLAMP jack, and connect the other end to the clamp.

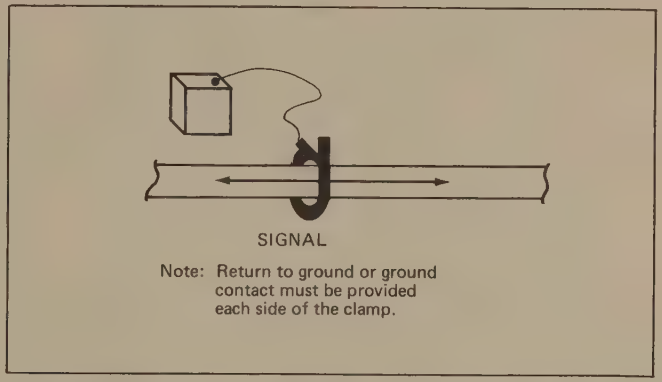

Figure 5-1 Using the Metroclamp on a Continuous Conductor

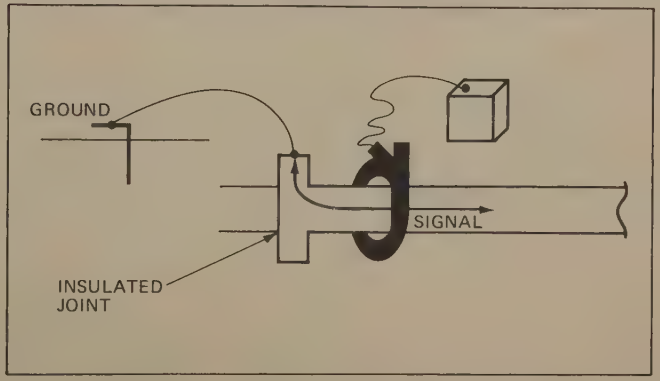

Figure 5-2 Connecting the Metroclamp with a Ground

2. Place the Metroclamp around the conductor, making sure that the clamp jaws are fully closed.

3. If a ground is required, connect the ground cable to the Ground jack on the Transmitter, and connect the other end to the conductor as shown in Figure 5-2.

4. Set the Output switch to LO (unless the situation requires HI power).

5. Pull the Transmitter POWER switch ON.

Using the 5120 Metroclamp with the Receiver

1. Connect the Metroclamp cable to the EXT INPUT jack on the rear panel of the Receiver.

2. Connect the other end to the clamp.

3. Place the clamp around the conductor, making sure that the jaws are fully closed.

4. Set the Selector switch to , the fourth position. A tone should be heard and a level indicated on the digital meter.

NOTE

If you are tracing a conductor in a cable, there may be some signal on an adjacent conductor. Test several conductors to confirm that the correct conductor has been traced.

General

6.01 This manual tells you how to operate the equipment, and the use of the accessories. This is only part of what you have to know in pipe and cable tracing. The indicated results are affected by other things beyond the control of the craftsman and his equipment. This chapter gives you some brief information about these things.

6.02 The Model 850 is used to trace conductors in open country, and in high density business and residential areas. In some regions, the soil is dry and rocky, and in others the ground is wet and heavy. Soil conditions and adjacent conductors may affect the results that you obtain.

6.03 The Model 850 transmits a signal at a frequency of about 10 kHz, and an output power of about 2 watts. This is a low frequency and strong signal, and on a continuous conductor, this signal will travel for a long distance. It will not radiate to adjacent conductors as much as a high-frequency signal. The 850 is most useful for tracing long transmission lines, large diameter water pipes (unless gasketed at the joints), or tracing conductors in congested underground conditions.

6.04 This low frequency signal does not cross high resistance junctions, and so would not be suitable for pipe with insulated joints. Where pipes are buried below six feet or so, or are set in recent dry backfill, it may be difficult to induce a signal using the Transmitter antenna. In these cases, better results will be obtained with a direct connection or by using the high frequency Models 810 or 480.

6.05 In these instructions, we have assumed that you know approximately where the cable or pipe is located. You may need to locate the pipe before you can trace it; see Paragraph 6.19.

Adjacent Conductors

6.06 When inducing a signal into a pipe or cable, some of the signal may be picked up by an adjacent conductor. If this happens, the indicated locations and signal levels will be unusual, and this will give you a warning that something is not correct. For example, there may be more than one peak around the conductor, or you will get different locations if the probe is raised off the ground. Figure 6-1 shows a weak adjacent field; Figure 6-2 shows a strong adjacent field, causing a trough between the two fields.

6.07 The Model 850 has the advantage of a digital meter that indicates signal strength, shown as 750 and 500 in the figure. These are only typical values. Figure 6-1 shows the effect an adjacent conductor will have on the radiated field of a target conductor. The directional meter will not indicate a sharp peak, and the indication may be unclear towards the adjacent conductor.

6.08 Figure 6-2 shows the situation where the adjacent conductor carries a strong signal. The combined field will have two peaks and one trough. Each of these points will give a center indication on the directional meter. This would be confusing on some instruments, but the Model 850 digital meter can give field strength readings which can identify the field shape as shown in the figure. This should allow you to first determine that there are other adjacent conductors, and with the digital readings you can estimate their location with some accuracy.

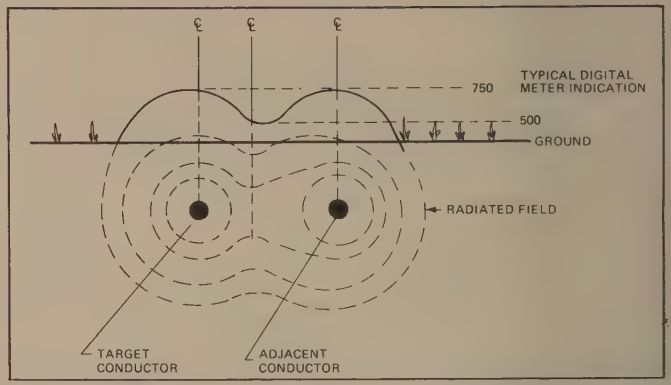

Figure 6-2 Combined Target Signal and Strong Adjacent Conductor Sign

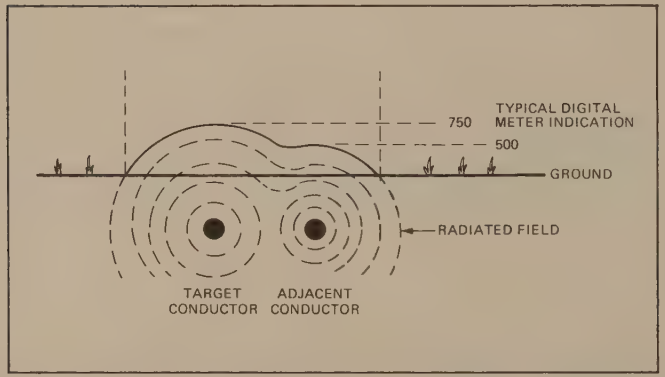

Figure 6-1 Combined Target Signal and Weak Adjacent Conductor Signal

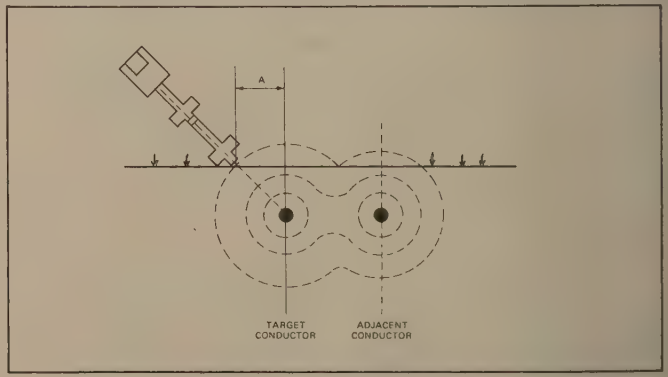

Figure 6-3 Depth Measurement with an Adjacent Conductor

6.09 Depth Measurement. Adjacent conductors can also make depth measurement difficult. Measuring using the procedure given in Chapter 4 may give an inaccurate result. We recommend that you tilt the Receiver through 45° and get a center indication on the directional meter. The distance "A" in Figure 6-3 is equal to the depth of the conductor. This method is not very accurate, but will enable you to check a depth measurement made using the procedure in Chapter 4. Note that the measurement is made from the side away from the adjacent conductor.

6.10 To trace a conductor in a duct with other conductors, we recommend that you use a Metroclamp on the Transmitter and Receiver.

In-Service Conductors

6.11 When tracing a cable, the Transmitter should be connected directly to the shield. Tracing will be easier if the far end of the cable is grounded in addition to grounding the Transmitter local ground.

6.12 Remove power from any cable when the direct connect method is used.

6.13 If it is not possible to follow the procedures in 6.08 and 6.09, use the Metroclamp to put the signal onto a conductor. It is not recommended that the Metroclamp be used with high-voltage lines that are conducting power.

Common Bonding

6.14 Where several conductors are connected, putting a signal on one will cause all connected conductors to carry the same signal, making individual conductor identification difficult. One method is to apply the signal to the common point, and trace each path to a convenient reference point. Check the relative signal strengths with the Metroclamp Look for the strongest signal on the digital meter.

6.15 The use of a Metroclamp on both the Transmitter and Receiver will help to identify an individual conductor.

Deep-Buried Pipes

6.16 The deeper a pipe is buried, the harder it is to induce a signal onto the pipe with the Transmitter antenna. Any pipe larger than 4 inches in diameter is too large for the Metroclamp. Again, the soil condition will affect the coupling. in general, dry, sandy or rocky soil will be worse than packed wet soil. Try to get a direct connection, or use a higher frequency tracer, such as the Model 810.

Locating a Pipe or Cable

6.18 If you do not know where a pipe or cable is located, you must first find its location before you can trace it. This procedure requires that one person carry the Transmitter while another person carries the Receiver, and they keep at least 45 feet apart. See Figure 6-4.

6.19 Walk in the area of the conductor with both the units turned ON. Align the Transmitter with the expected direction of the conductor.

6.20 Look for an indication on the Receiver. When this is found, locate the point where the signal is strongest, and mark the spot. Rest the sensor of the Receiver on the ground, and keep the unit upright.

6.21 Point the arrow on the Transmitter towards the Receiver. Move the Transmitter across the conductor path while the signal strength is read on the Receiver digital meter. Mark the point where the received signal gives the highest digital indication.

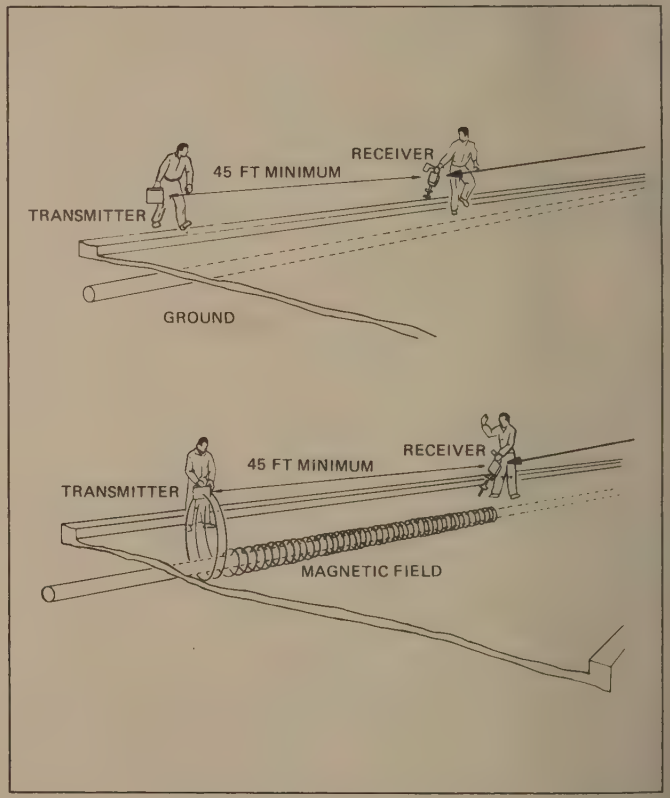

Figure 6-4 Locating a Pipe or Cable

General

7.01 The only routine maintenance required for the Model 850 equipment and accessories is to test and recharge or replace the batteries. A battery test function is provided so that the condition of the batteries can be displayed at any time.

Transmitter Battery Check and Recharge

7.02 To check the Transmitter battery condition, proceed as follows:

1. Pull the POWER switch ON. The battery check lamps will light for about 5 seconds, indicating the charge remaining, 25-50%; 50-75%; 75-100%. If no indicators light, less than 25% of the charge remains.

2. Calculate the operating time remaining. When used at LO power, the battery will last 24 hours on a full charge, 18 hours on a 75% charge, 12 hours on a 50% charge, and 6 hours on a 25% charge.

3. When the battery requires recharging, plug the battery charger lead into the "12V DC" connector on the Transmitter top panel. Plug the other end into the wall socket (120V). The battery requires about 14 hours to recharge.

Receiver Battery Check and Replacement

7.03 To check and replace the Receiver batteries, proceed as follows:

1. Set the Selector switch on the Receiver to the second position.

2. Check the needle position on the directional meter. The needle should deflect beyond the BATT CHK line. The distance over the line indicates approximately the condition of the batteries.

3. If the batteries need replacing, go to the rear panel of the Receiver and pull the BATTERY ACCESS stud. Replace all four cells with NEDA 1604A alkaline cells, making sure that the batteries are installed with the positive (+) end to the positive terminals.

4. Close the rear panel, making sure that it is shut securely.

Replacing the Transmitter Battery

7.04 If the Transmitter battery is always kept fully charged, and not allowed to remain discharged for long periods, it should not require frequent replacement.

7.05 If the Transmitter battery requires replacement, follow these instructions: Use a type NP6-6 6V battery by YUASA.

1. Undo the four screws, two at each end of the unit that attach the top panel to the case. Carefully lift panel off the case. See Figure 7-1.

2. Pull the battery up and out of the case. Note the guides at one end and on the bottom of the case. See Figure 7-2.

3. Pull the two leads from the terminals. Note that the red lead goes to the positive (+) terminal and the black lead to the negative (—) terminal. See Figure 7-2. Connect these leads to the new battery on the same polarity terminals.

4. Slide the battery back into the case (note the direction of the terminals), into the guides provided.

5. Replace the top panel and secure it to the case with the four screws.

6. Pull the POWER switch ON, and check that the battery lamps light. Charge the fresh battery if required.

Preventive Maintenance

7.06 Always store the Model 850 equipment and accessories in the carrying case when not in use. Do not leave any of this equipment in direct sunlight for prolonged periods.

7.07 The Model 850 is designed for rugged outdoor use, but rough handling should be avoided. Do not allow the equipment to get wet. Keep the sensor shaft clean and free of grit.

7.08 If the equipment does not function properly, replace or recharge the batteries. If this does not correct the problem, contact the customer service department at the factory or a Metrotech authorized repair station.

Failure to Operate

7.09 If the Transmitter fails to operate, you can check the battery fuse. Remove the top panel from the case, See Figure 7-1. Check to see if the fuse is blown, and replace if necessary. The fuse location is shown in Figure 7-2.

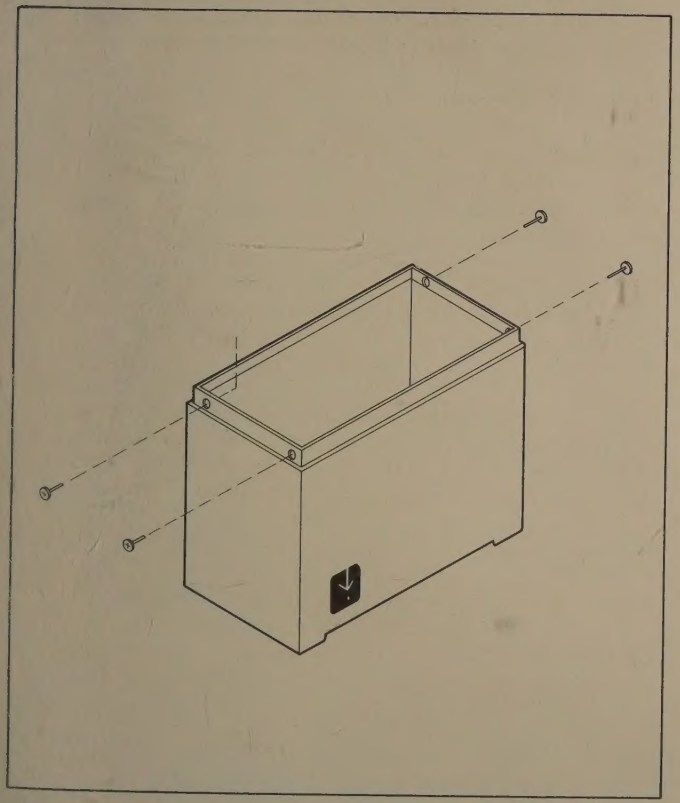

Figure 7-1 Removing the Transmitter Top Panel

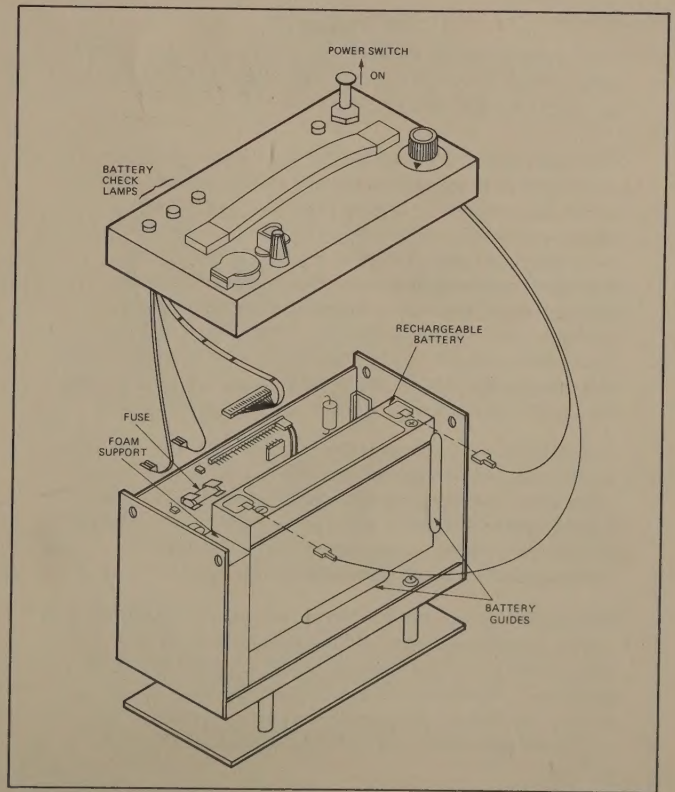

Figure 7-2 Replacing the Transmitter Batteries

WARRANTY

THERE ARE NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY, BEYOND THOSE STATED HEREIN.

Metrotech warrants its equipment to be free from defects in workmanship or material under normal and proper use and service for one year from date of purchase by original user. Metrotech assumes no obligation to repair or replace equipment which has been altered or repaired by other than Metrotech approved procedure; been subject to misuse, misapplication, improper maintenance, negligence or accident; had its serial number or any part thereof altered, defaced or removed; or been used with parts other than those approved by Metrotech. Warranty does not include batteries. Expendable items such as fuses and lamps are excluded.

Any detection product proved defective under this warranty will be repaired or replaced free of charge at the Metrotech Corporation factory or approved Metrotech repair station. The equipment should be returned to our factory by prepaid transportation after requesting and receiving return authorization from our Service Department.

Metrotech's obligations are limited to repair or replacement of broken or defective parts which have not been abused, misused, altered or accidentally damaged, or at the option of Metrotech, to refund of the purchase price. Metrotech assumes no liability for removal or installation costs, consequential damages, or contingent expenses of any other nature.

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